What is claimed is:

1. A method for reducing the pore size of an inorganic membrane having a matrix of material particles including pores with pore walls therein, said method comprising depositing at least one monolayer of an inorganic compound uniformly on the surface of the particles which make up the pore walls of the pores of said matrix.

2. A method for reducing the pore size of an inorganic membrane as claimed in claim 1 wherein depositing of said at least one monolayer comprises depositing a sufficient number of said monolayers to reduce the mean pore diameter of said pores to below about 20 Å.

3. A method for reducing the pore size of an inorganic membrane as claimed in claim 1 wherein depositing of said at least one monolayer comprises depositing a sufficient number of said monolayers to reduce the mean pore diameter of said pores to no greater than 5 Å.

4. A method for reducing the pore size of an inorganic membrane as claimed in claim 1 wherein said depositing of said at least one monolayer comprises vapor treating the inorganic compound with a reactive vapor of a precursor inorganic compound which includes a reactive group that reacts with surface hydroxyls on said inorganic compound, and which reacts with water, so as to produce a reaction with the surface hydroxyls on the inorganic compound surface to thereby bond precursor molecules to the inorganic compound, and

thereafter treating the inorganic compound surface with water vapor to convert the precursor inorganic compound into the corresponding inorganic compound.

5. A method for reducing the pore size of an inorganic membrane as claimed in claim 1 wherein said inorganic compound is treated with a precursor inorganic compound selected from the group consisting of chloro-silanes, organo-silicon compounds, chloro-titaniums, organo-titanium compounds, and organo-aluminum compounds, chloro-zirconia, and organo-zirconia compounds.

6. A method for reducing the pore size of an inorganic membrane as claimed in claim 4 wherein the inorganic compound is made of an inorganic compound selected from the group of alumina, titantia, zirconia, silica and alumina/silica mixtures.

7. A method for reducing the pore size of an inorganic membrane as claimed in claim 4 further comprising drying the inorganic compound prior to treating the inorganic compound with said reactive vapor of said precursor inorganic compound.

8. A method for reducing the pore size of an inorganic membrane as claimed in claim 7 wherein said drying comprises heating the inorganic compound and holding the inorganic compound at temperature of 100°C to 200°C for one to two hours in an evacuated vessel.

9. A method for reducing the pore size of an inorganic membrane as claimed in claim 8 wherein said treating of said inorganic compound with said

reactive vapor of said precursor inorganic compound comprises introducing said reactive vapor into said evacuated vessel, evacuating the vessel to remove unreacted precursor inorganic compound products and then introducing said water vapor into the vessel.

10. A method for reducing the pore size of an inorganic membrane as claimed in claim 9 further comprising evacuating and refilling the vessel with said reactive vapor a plurality of times.

11. A method for reducing the pore size of an inorganic membrane as claimed in claim 9 wherein said inorganic compound is comprised of gamma-phase alumina and said vapor treating with a reactive vapor comprises treating the inorganic compound with a trimethyl aluminum vapor.

12. A method for reducing the pore size of an inorganic membrane as claimed in claim 9 wherein said inorganic compound is comprised of gamma-phase alumina and said treating with a reactive vapor comprises treating the inorganic compound with an anhydrous aluminum chloride vapor.

13. A method for reducing the pore size of an inorganic membrane as claimed in claim 9 wherein said inorganic compound is comprised of gamma-phase alumina and said treating with a reactive vapor comprises treating the inorganic compound with a titanium tetrachloride vapor.

14. A method for reducing the pore size of an inorganic membrane as claimed in claim 1 wherein said at least one layer is deposited only on one side of said inorganic compound.

15. A method for reducing the pore size of an inorganic membrane as claimed in claim 14 wherein, prior to depositing said at least one layer, said inorganic compound is seated in a holder which enables deposition on only said one side.

16. A method for reducing the pore size of pores in a surface of an inorganic membrane to a mean pore diameter of below about 10 Å, said method comprising the following steps:

(a) drying the inorganic membrane to remove water from the pores thereof while leaving surface hydroxyls;

(b) exposing the inorganic membrane to a reactive vapor of precursor inorganic compound having a reactive group to effect reaction thereof with said surface hydroxyls to bond precursor molecules to the inorganic compound surface;

(c) exposing the inorganic membrane to water vapor to hydrolyze the precursor molecules and produce an inorganic compound deposit; and

(d) repeating at least steps (b) and (c), as necessary, to reduce the mean pore diameter of a surface of the inorganic compound of about 10 Å.

17. A method for reducing the pore size of pores as claimed in claim 16 wherein said drying comprises placing said inorganic compound in a heated evacuated vessel to effect drying of the inorganic compound, said reactive vapor being introduced into said vessel after drying of said inorganic compound

and said water vapor being introduced into said vessel after removal of unreacted products of said reaction.

18. A method for reducing the pore size of an alumina membrane, said method comprising: treating the aluminia membrane with trimethyl aluminum so that molecules of the trimethyl aluminum react with hydroxyls on the surface of the alumina membrane and are chemically bonded to said surface and methane is produced as a reaction product; and treating the alumina membrane with vapor water so that water molecules react with any remaining methyl groups to liberate methane and to leave hydroxyl groups attached to deposited aluminum.

19. A method for reducing the pore size of an alumina membrane as claimed in claim 18 wherein the alumina membrane is dried prior to treatment thereof with said trimethyl aluminum.

20. A method for reducing the pore size of an alumina membrane as claimed in claim 19 wherein said drying comprises heating the alumina membrane and holding the alumina membrane at a temperature of 100°C to 200°C for one to two hours in an evacuated vessel.

21. A method for reducing the pore size of as claimed in claim 20 wherein said trimethyl aluminum is introduced as a vapor into said vessel.

22. A method for reducing the pore size of pores in a surface of a porous ceramic membrane to a mean radius at least as small as 5 Å, said method comprising the following steps:

(a) drying the ceramic membrane to remove water from the pores thereof while leaving surface hydroxyls;

(b) exposing the membrane to a reactive vapor of precursor ceramic compound having a reactive group to effect reaction thereof with said surface hydroxyls to bond precursor molecules to the membrane surface;

(c) exposing the membrane to water vapor to hydrolyze the precursor molecules and produce a ceramic deposit; and

(d) repeating at least steps (b) and (c), as necessary, to reduce the mean pore radius of a surface of the membrane to at least small as 5Å.

23. A method for reducing the pore size of pores as claimed in claim 22 wherein said drying comprises placing said membrane in a heated evacuated vessel to effect drying of the membrane, said reactive vapor being introduced into said vessel after drying of said membrane and said water vapor being introduced into said vessel after removal of unreacted products of said reaction.

24. The method of claim 4 wherein said vapor treating is carried out in a temperature range of ambient temperature to about 300°C.